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U.S. Department of the Interior  
Bureau of Land Management

**FINAL**

Burns District, Oregon

November 1985

# Diamond Craters Recreation Area Management Plan



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# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

BURNS DISTRICT OFFICE  
74 S. Alvord Street  
Burns, Oregon 97720

November 27, 1985

Dear Diamond Craters User :

The final Diamond Craters Recreation Management Plan has been completed and a copy is enclosed for your use.

This document outlines the management direction the Bureau of Land Management will be taking in the coming years for the Diamond Craters Outstanding Natural Area.

These decisions are the result of written and personal public comments received during the 30-day comment period on the draft document.

After another 30-day public review period from this publication date, the decisions outlined in this final document will be implemented. All comments should be sent to the Burns District Manager, BLM, 74 S. Alvord St., Burns, Oregon 97720 by December 30, 1985.

Thank you for your interest and support in BLM's Diamond Craters Outstanding Natural Area.

Sincerely yours,

Joshua L. Warburton  
District Manager



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Recreation Area Management Final Plan for the Diamond Craters  
Outstanding Natural Area

Oregon

U.S. Department of the Interior  
Bureau of Land Management  
Burns District, Oregon

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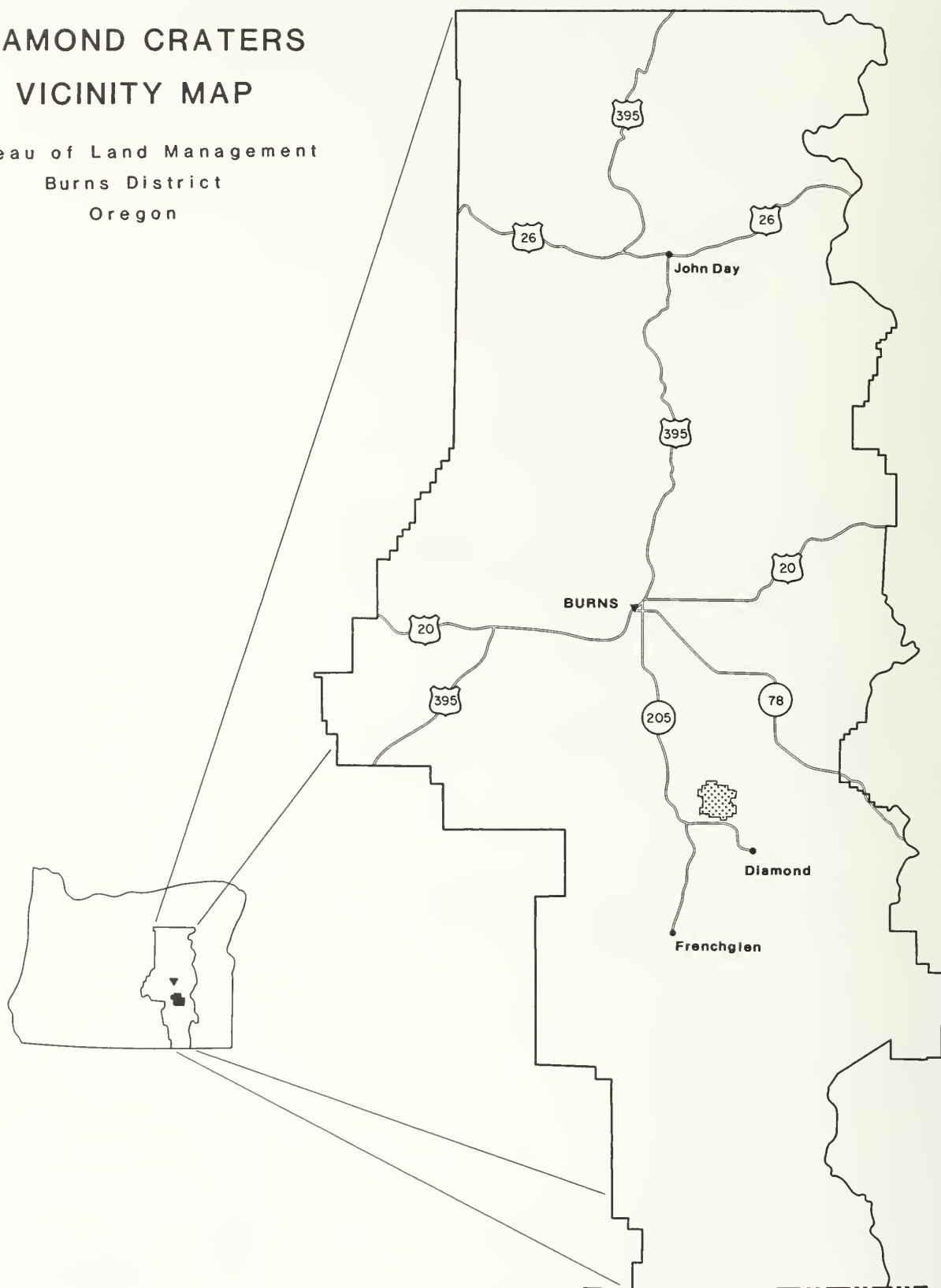


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# DIAMOND CRATERS VICINITY MAP

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Oregon

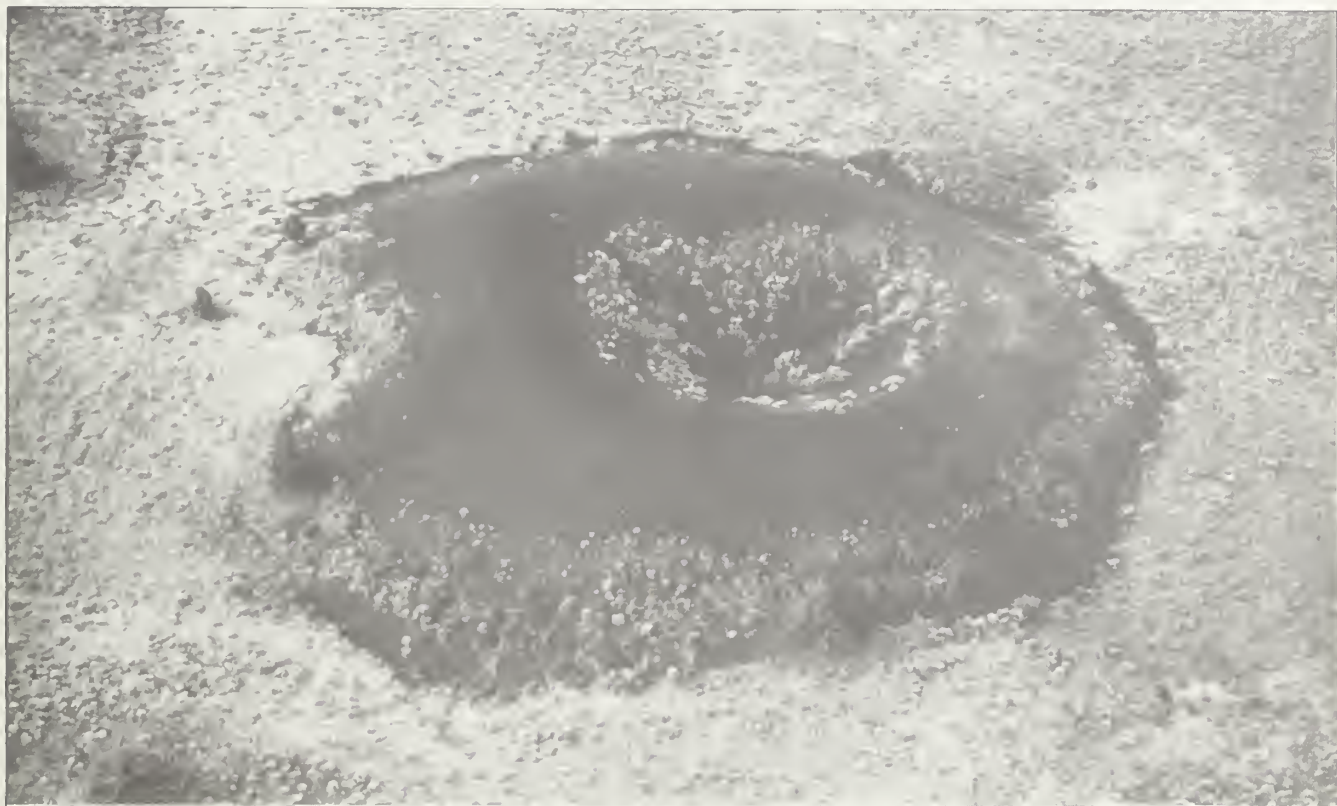


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# Part I—Introduction



Little Red Cone

## Background

### Purpose and Scope

The purpose of this recreation plan is to identify specific actions and their sequence for implementation to manage Diamond Craters as an Outstanding Natural Area (ONA) and Area of Critical Environmental Concern (ACEC).

The scope of this issue-oriented document is limited to a discussion of those actions required to resolve issues and utilize the opportunities available in the area. Detailed site planning and facility designing will be considered following approval of the specific management actions.

### Relationship to Bureau Planning

Diamond Craters is a special management area identified in the Drewsey Resource Area Management Framework Plan (now part of the Three Rivers Resource Area) in the Burns District. Its designation as an ONA and as an ACEC is consistent with the District's land use recommendations and decisions.

### Historical Perspective

Diamond Craters were known to the early settlers of eastern Oregon and were named about 1875 for their proximity to the Diamond Ranch. This ranch took its name from the diamond-shaped cattle brand used by Mace McCoy, an early settler. The name Diamond was also given to a small community and post office nearby.

The main interest shown in the area was as a source for cinders and building stone. The pahoehoe lava from Diamond Craters has been used for construction since the late 1800's. Many of the local roads and driveways are covered with Diamond Craters cinders. Numerous buildings, including the well-known Round Barn, are faced with slab lava from the Craters.

More recently thin slabs of basalt attracted the attention of rock dealers who removed the lava without authorization to sell for decorative facing stone. The trespasser's heavy equipment shattered the pahoehoe to powder, which left permanent scars, while the removal of the basalt destroyed features necessary for interpretation of the geology. It was not until the mid 1960's that a significant number of educators and students became knowledgeable and concerned about the natural resources of the Craters. Few realized what outstanding values it held. Courses offered at the

Malheur Field Station stimulated interest in Diamond Craters which led to the protective designations and management direction followed today by the Bureau.

## Recent Secretarial Actions

The Bureau designated Diamond Craters as an Area of Critical Environmental Concern on December 2, 1980. This designation declared special management attention be given to protect and prevent irreparable damage to the geologic features and ecosystems of the area.

Public Land Order 5822 withdrew 16,656.18 acres of public lands on January 22, 1981, from the operation of the general land laws including the mining laws, but not from leasing under the mineral leasing laws for the protection and preservation of geologic and biological resources of exceptional scientific, educational, scenic and recreational values.

Diamond Craters was designated as an Outstanding Natural Area on April 1, 1982, under the general category of Recreation Lands, which identifies lands where recreation is expected to be a major use. As Class IV Recreation Lands, Outstanding Natural Areas are "areas of outstanding scenic splendor, natural wonder or scientific importance" that merit special attention and care in management to ensure their preservation in their natural condition.

## Setting and Multiple Resource Values

### Location and Access

Diamond Craters is located near the center of Harney County in southeast Oregon's high desert country. The area lies about 40 air miles southeast of Burns in Township 28 and 29 South, Range 32 East. It is remote from population centers but access is not difficult. One route is southeast from Burns on Oregon State Highway 78 to the junction at New Princeton, then south and west by well-marked all-weather roads that skirt the eastern and southern parts of the Craters. Another route is south from Burns via Oregon State Highway 205 and Diamond Lane, a paved county road.

### Area Size and Ownership

The boundaries of the land for which this management plan is written are the same as that delineated for the ONA and ACEC designations. The area contains 16,656 acres of public land adjoining the Malheur National Wildlife Refuge on the southern and western boundaries. The acreage may change as recommended land acquisitions occur to place additional parcels within the boundaries of the area.

## Landscape Character

The most striking visual characteristic of this landscape is the geologically recent volcanic activity. The exposed lava flows, vents, craters, and domes intersperse with pockets of vegetation are the dominant features. The landform is gently rolling to nearly flat, interrupted by vents and craters that usually appear as depressions rather than cones. The landform has no strong linear qualities. Course textured rock outcrops are frequent, as the vegetation has not developed to completely cover the recent volcanic flows.

The dark colored volcanic rocks intermix with the tans and greens of the vegetation to create a subtle contrast in color and texture. Grasses and sagebrush are the common vegetative cover. Water is seldom visible in the landscape.

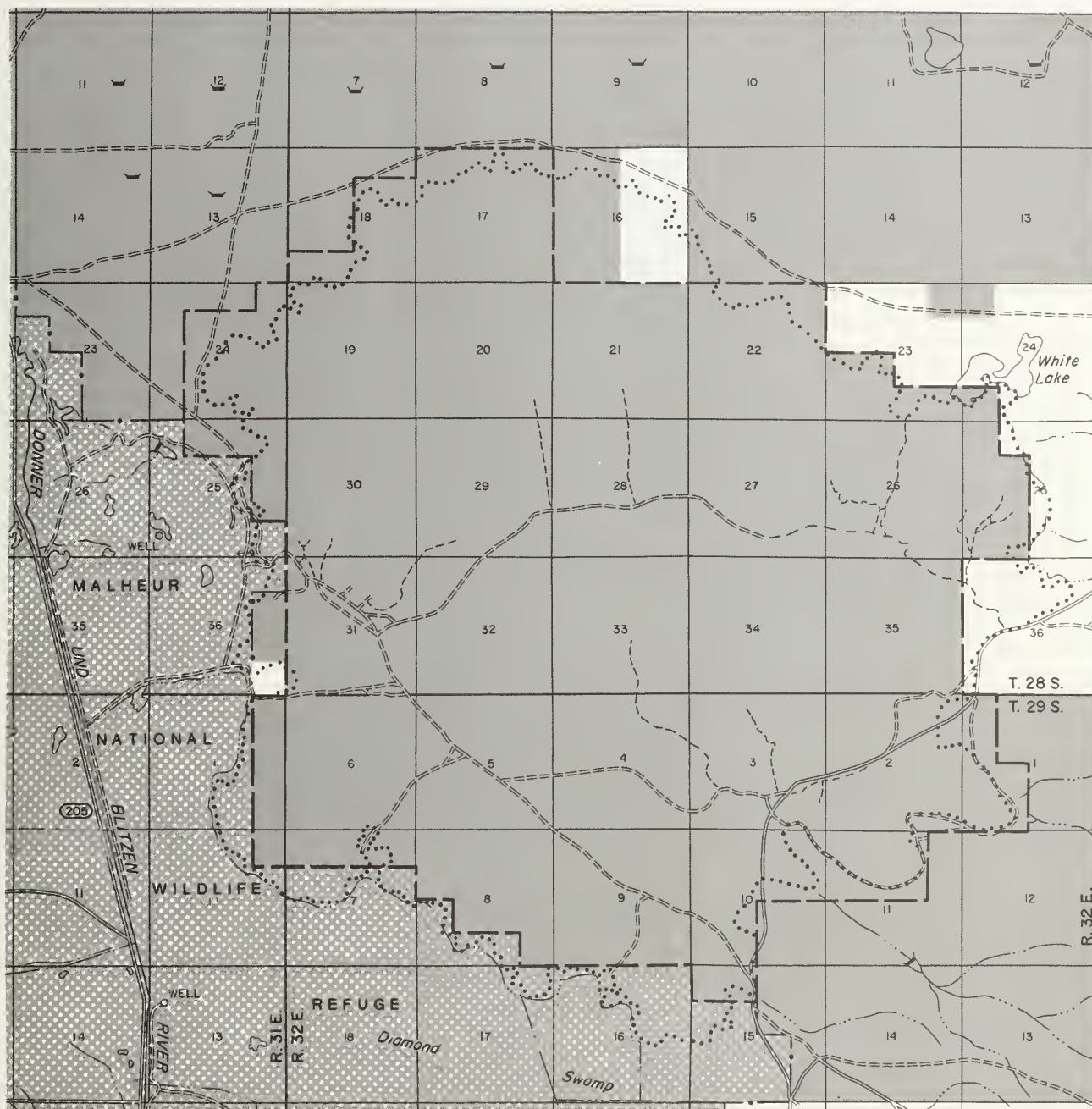
## Climate

Summers are hot and dry. Most of the precipitation falls during the cold winters and early spring; mean annual precipitation varies between 6 and 16 inches. Sunshine occurs approximately 225 days per year. Daily maximum and minimum temperatures can be extreme during a single day and frosts may occur any night of the year.


## Geology

Diamond Craters is geologically unique in the United States. A great variety of basaltic igneous-volcanic structures representing a complex series of geologic events are present within a small geographic area. Preservation of volcanic features is excellent due to a lack of erosion (Peterson and Groh, 1964). The unusual concentration of igneous features is related to the geologic environment occurring at the junction of the High Lava Plains Province and the Basin and Range Province at the time of volcanic activity.

The geology of the area illustrates a sequence of intrusive, extrusive and pyroclastic igneous activity resulting in complex eruptions associated with unusual localized doming. These eruptions display the entire range of explosive and collapse activity which can occur in conjunction with basaltic volcanism, from extremely fluid fissure-type eruptions to highly explosive maar and caldera structures. Some of the individual features are: a graben; domal structures; a caldera; a maar; craters and vents; cinder cones; spatter cones; dribble spires; kipukas; pahoehoe and aa flows; pressure ridges and collapse structures; lava toes; ash fall and cinder tephra with cored bombs; tensional fractures; surface flow features; and lava trenches, semi-trenches, and tubes with unusual lining formations. This array of features has been called a museum of basaltic volcanism.



# LEGEND

- Boundary of Outstanding Natural Area
- ... Edge of Diamond Craters Flows
-  Malheur National Wildlife Refuge
-  BLM Lands
-  Private Lands

## MAP 1 DIAMOND CRATERS

U.S. DEPARTMENT OF THE INTERIOR  
Bureau of Land Management

Burns District  
1985



## Speleology

Diamond Craters contains a wide diversity of significant speleological resources. Numerous caves have been discovered in the ONA, both in the domes and in the flank flows, and there is great potential for future discoveries (Anon., 1961; Larson, 1977; Benedict, 1980). Several caves contain unusual, if not rare, speleothems (i.e., cave formations) and linings. The flank flows exhibit every degree of collapse and roofing possible for pahoehoe lavas. A specialized subterranean mite is suspected to inhabit a 40 footdeep fissure in Northeast Dome, but further studies are needed for verification.

## Soils

Most soils are either Entisol (young) or Aridosol (arid) and were derived from fine tephra. They are coarse textured, lack strong soil development, have a light colored profile and vary in depth from 20 inches to greater than 40 inches. They are neutral to slightly alkaline in pH. Near the southern and western edges, there are small inclusions of dark colored Mollisol (grassland) soils which have a silty texture and are poorly drained.

## Minerals, Oil, Gas, Geothermal

Diamond Craters is classified by the U.S. Geological Survey as prospectively valuable for geothermal energy. Data quality is poor, but evidence indicates an area of high heat flow with the possibility of a low temperature geothermal reservoir.

The U.S. Geological Survey has classified the Diamond Craters area as prospectively valuable for oil and gas. Very little exploration has occurred throughout the Harney Basin, so the actual potential is unknown.

No metallic minerals are known to occur at Diamond Craters. Their presence is unlikely within the types of volcanic materials forming the Diamond Craters geologic unit; they may occur in underlying formations. There has been some exploration for uranium in the Harney Basin. The primary non-metallic mineral commodities present at Diamond Craters are basalt and basaltic cinders. These occur in substantial quantities as rock suitable for crushing (for aggregate and road surfacing), cinders (for road surfacing), and slab lava (for building and veneer stone). Other non-metallic commodities such as zeolites and saline brines may occur at depth.

Historical mineral production from Diamond Craters has been low, limited to some use of cinders for road construction and small quantities of slab lava for building and veneer stone. The majority of use of these materials has been local. Under ONA management, the cinder pits will be closed and the sites rehabilitated. Since 1956, the area has also been withdrawn from mineral appropriation under the mining laws. Little interest has been expressed in leasable minerals.

## Water

Aquatic zones constitute less than five percent of the area. Malheur Maar, a spring-fed, permanent lake within an explosion crater, is the only body of water of any size which occurs within the interior of the Diamond Craters flows. This lake is approximately 6 feet deep and 200 feet in diameter; there are nearly 60 feet of sediments beneath the water. White Lake lies at the northeastern edge of the flow and historically contained water intermittently. It has remained filled in recent years since higher than normal water runoff has become common in southeastern Oregon. The remaining Wetlands are adjacent to the Refuge along the southern and western edges of the flow; water levels are regulated by the Refuge.

## Vegetation

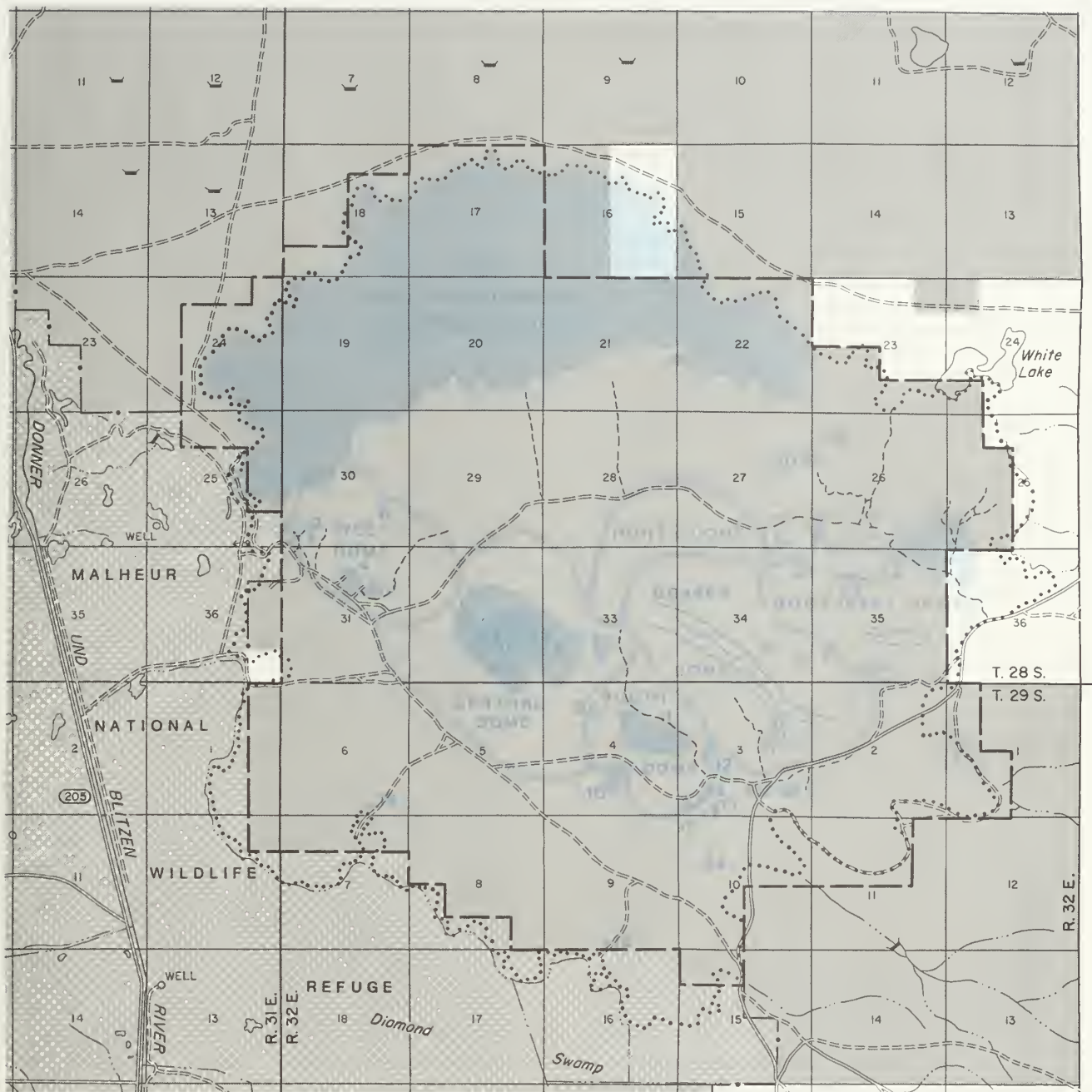
Diamond Craters is located in the Northern Great Basin at elevations between 4150 and 4700 feet above sea level. It occurs at the ecotones between the Desert Shrub, the Shrub-Steppe and the Western Juniper-Big Sagebrush Zones and contains both unusual and representative species and communities of the Uplands and the Wetlands. Over 240 species of vascular plants have been identified.

Young cinder based soils support relatively undisturbed native bunchgrass communities of needle-and-thread grass (*Stipa comata*, *S. thurberiana*) and bluebunch wheatgrass (*Agropyron spicatum*). The shrub community is dominated by big sage (*Artemisia tridentata*), and occasionally rabbitbrush (*Chrysothamnus viscidiflorus* and *C. nauseosus*). Western juniper and big sage (*Juniperus occidentalis*/*Artemisia tridentata*) form an open woodland community in the northern portion and at higher elevations. A small aspen grove (*Populus tremuloides*) borders the southern edge. The low elevation of the stand is unusual in the Harney Basin.

## Wildlife

The ONA provides a protected area where the genetic diversity of the species in the central Harney Basin can be maintained. The wide diversity of geological substrates and landforms in combination with the very diverse vegetation, provides abundant nesting, resting and feeding habitats for wildlife, both vertebrates and invertebrates. Raptors such as red-tail hawks, long-eared owls, great horned owls, screech owls, golden eagles and prairie falcons nest on the crater ledges and in juniper trees. Fallen rocks in craters and near rock outcroppings create ideal small hollows for turkey vulture nests.

Nineteen species of amphibians and reptiles, 52 species of mammals, and 189 species of birds are known or suspected of occurring at Diamond Craters. To date, no rare or endangered species of animals are known from the Craters. However, Gruber discovered a highly unusual mite inhabiting a deep fissure with per-



LOCATION OF SELECTED GEOLOGIC LANDFORMS AT DIAMOND CRATERS

- |                           |                          |
|---------------------------|--------------------------|
| Dry Maar                  | Aspen Spring             |
| Malheur Maar              | Rutherford Lake          |
| Multiple Explosion Crater | Cloverleaf Crater        |
| Western Twin Crater       | Wingo Cave System        |
| Eastern Twin Crater       | Natural Bridge           |
| Nolf Crater               | John Kelly's Earth Crack |
| Big Cinder Crater         | Holsinger Cave           |
| Deep Throat               | Rowan Crater             |
| Ring Spatter Cone         | Mossy Crater             |
| Red Bomb Crater           | Little Red Cone          |
| Oval Crater               | Current Crater           |
| Keyhole Crater            | Brown's Crater           |
| Spatter Cone Crater       | Spatter Area             |
| Lava Pit Crater           | Collapsed Trench System  |
| Surprise Pit Crater       | Cored Bombs              |
| Bacon Cave                | Collapse Features        |
| Big Bomb Crater           | Caves                    |

Geologic feature

Structural dome

Fault

Cave

## MAP 2 DIAMOND CRATERS

U.S. DEPARTMENT OF THE INTERIOR  
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Burns District

1985

1 0 1 2 MILES

manent ice in Northeast Dome — the fissure is 40 feet deep, eight feet wide and several hundred feet long. Similar fissures in Arizona contain “cave adapted” invertebrates.

Several vertebrate species are included on various Oregon “lists of concern” (Storm, 1966; Marshall, 1969; Olterman and Verts, 1972; Stoel, 1978). For example, both the black-throated sparrow and the whiptail lizard occur at Diamond Craters very near the northern limits of their breeding range. Various raptors nest on basaltic ledges and in the juniper trees. Big-eared bats, which are of special concern to many speleologists have been observed. Extensive field work is needed to determine the true rarity of these species.

Since 1972, Diamond Craters has been used in at least four separate, ecological studies: pseudoscorpions (Benedict), long-eared owls (Johnstone), canyon mouse (Fisher and Cross, 1979), and the paleoecology of the Great Basin (Aikens et al., 1978, 1979; Mehringer). McKenzie noted the presence of melanistic forms of western fence lizards and Turner observed melanistic forms of small rodents. Herman observed canyon and rock wrens nesting sympatrically in the same crater; this relationship has not been seen at other geographic locations.

## Cultural Resources

Although Diamond Craters isn't known for its cultural resources, one or two lithic scatter sites have been discovered. Even more important, however, is the sediment record deposited beneath the waters of Malheur Maar, a freshwater lake 200 feet in diameter and 6 feet deep which is located in one of the explosion craters of West Dome. Peter Mehringer, Jr., Department of Geology and Anthropology, Washington State University states:

Malheur Maar is the only low elevation desert lake between Canada and Baja which contains an unbroken sedimentary column which spans the past 6,000 years; the lake is especially significant due to its rapid rate of deposition, its permanency and its location at the shadscale-sagebrush ecotone.

Mehringer and his graduate students, as part of the Steens Mountain Prehistory Project, have removed a 15 meter core of sediments from Malheur Maar. The core from Malheur Maar and amber rat samples from Surprise and Spatter Cone Caves, along with materials from sites outside of Diamond Craters, are being studied in order to reconstruct the ecological history and the movements of humans in the Great Basin since the end of the Pleistocene.

## Recreation/Natural Area Values

The district has gathered data since 1972 concerning:

(a) the unique and/or scientific-educational values encountered by users of Diamond Craters, and (b) the scientific investigations conducted there. Communications and reprints are on file at the District Office. This data gathering process reveals that Diamond Craters is used as an outdoor classroom and laboratory by several thousand visitors per year who are interested in basaltic volcanism, and/or intrigued by the survival of biota in semi-arid environments. Visitors include field trip groups touring the Refuge and Steens Mountain, students taking classes at the Malheur Field Station, scientists studying various problems, and local residents with guests. Visitors are of every age group and come not only from all parts of the United States but from foreign countries.

A self-guided auto tour has been developed that highlights outstanding natural features which can be seen when travelling by vehicle. There are numerous stops which the guide locates and interprets for the interested visitor.

Diamond Craters is managed under Visual Resource Management Class II, meaning that changes should not be evident in the characteristic landscape.

## Wilderness Study Areas

Diamond Craters lacks wilderness characteristics and was eliminated from further Wilderness Review in March, 1980.

## Range (Livestock and Wild Horses)

Domestic livestock was brought into southeastern Oregon around 1870 and by 1900 most of Diamond Craters was heavily grazed by horses, cattle, and sheep. In 1960, fenced seedings were developed to the north and no federal grazing preference is now assigned in the Craters. In addition, grazing permits were eliminated by the Diamond Community Allotment Agreement of July 10, 1970, and wild horses were rounded up and removed from the area in November, 1979. The allotment agreement does recognize trailing access by several local permittees.

## User Profile and Visitor Estimates

No specific visitor use analysis has been made where traffic counters and on-site interviewing were utilized to determine user characteristics and numbers. The Malheur National Wildlife Refuge kept a questionnaire for several years and estimated about 20 percent of their visitors went to see Diamond Craters.

The 1978 figures for visitor use of the Malheur National Wildlife Refuge totalled 37,866 with an estimated 7,533 journeying to the craters. Visitors come not only from all parts of Oregon, but from the rest of the United States and foreign countries (Pope, 1978). The Malheur Field Station, under the sponsorship of Pacific University, utilizes the area as an outdoor classroom. Diamond Craters is especially interesting to individuals studying basaltic volcanism and/or those intrigued by the survival of biota in semi-arid environments. Present visitors include field trip groups and sightseers touring the Malheur National Wildlife Refuge and other points of interest in the Northern Great Basin, students taking classes at the Malheur Field Station and scientists studying various problems. Scientists studying Diamond Craters include Dr. Bruce Nolf, a geologist at Central Oregon Community College, Dr. Ellen Benedict, a speleologist at Portland State University, and Dr. Peter Mehringer, Jr., a geologist/anthropologist at Washington State University.

Future use by the public is expected to increase as Diamond Craters becomes better known. The land will continue to be managed for its scientific, educational and scenic values. Recreational use will be compatible with preserving the natural and scenic values.

The following table shows demand projections for recreation activities in the Pacific Northwest based on projection of participation by annual percentage increases. The recreation activity of sightseeing is used to project visitation.

**Table 1**  
**Recreation Demand Projections**

	1977-1989 Annual Avg. % Increase	1990-2000 Annual Avg. % Increase
Camping		
Developed	1.28	2.76
Dispersed	1.28	1.50
Picnicking	1.01	1.17
Fishing	1.15	1.90
Hunting		
Big Game	1.22	1.14
Small Game	.45	1.42
Upland Game	.45	1.42
Waterfowl	1.48	1.25
Sightseeing	1.01	1.09
Watersports	1.15	1.15
Wintersports	1.61	1.59
Off-Road Vehicle	.74	1.04

Source: U.S. Forest Service, An Assessment of the Forest and Range Land Situation in the United States, January 1980.

The following table illustrates the estimated recreation visits for Diamond Craters for the 10 year period 1985—1995 using a 1.01 per cent annual increase from 1978 through 1989 and a 1.09 percent annual increase from 1990 through 1995. No data is available for estimating visitor days during this period.

**Table 2**  
**Diamond Craters Use Projections**

Year	Visitors Per Year
1978	7,500
1979	7,600
1980	7,700
1981	7,750
1982	7,850
1983	7,900
1984	8,000
1985	8,100
1986	8,150
1987	8,250
1988	8,350
1989	8,400
1990	8,500
1991	8,600
1992	8,700
1993	8,800
1994	8,900
1995	9,000



Smooth surface of Pahoehoe lava

# Major Issue

Successful planning and management can only be achieved by recognizing and resolving important issues. This section identifies the issue considered in Part III, The Management Plan.

## Issue-Environmental Protection and Rehabilitation

### ***Comment***

Diamond Craters possesses resource values of national significance. The past damage to these resources, in addition to increased recreation and educational use, has created a need to initiate measures to protect and rehabilitate Diamond Craters. The stages in the intensity and methods of management will require thorough examination before implementation.

### ***Considerations***

#### **Acquisition/Easements**

- Land Base Adjustments

#### **Cultural Values**

- Site Protection

#### **Supervision**

- Law Enforcement/Visitor Safety
- Visitor Use Monitoring
- Visitor Use Allocation System
- Public Information and Education Program

#### **Administration**

- Motorized Vehicle Use
- Special Use Permits
- Land and Mineral Entry

#### **Facility Management**

- Future Developments
- Facility Operation and Maintenance
- Signs Program

#### **Area Access**

- Existing Roads
- New Road Development
- High Desert Trail Route/Other Trail Routes

# PART II—MANAGEMENT OBJECTIVE AND CONSTRAINTS



Fracture near edge of Lava Pit Crater flow

## Management Objective

Diamond Craters Outstanding Natural Area/Area of Critical Environmental Concern will be managed to preserve the unique assemblage of geologic features and ecosystems so that present and future generations may benefit from the exceptional scientific, educational, scenic and recreational values.

## Management Constraints

Factors which, because of law, policy, regulation or circumstance (see Appendix B) influence the development of a management program presented in Part III include:

- Diamond Craters is used as an outdoor classroom/laboratory by educators.
- Several delicate and unusual invertebrates are found in the area.
- Several plant species are considered for listing on the Oregon State List of Sensitive, Threatened and Endangered Plant Species.
- Several vertebrate species are included on various Oregon "lists of concern".
- Several ecological relationships are unusual or unique to the area.
- Malheur Maar has high value for anthropological and paleoclimate evolution research purposes.
- Numerous fragile, diverse and unique volcanic landforms can be found within the boundaries of the ONA.
- Unauthorized removal of cinders for road surfacing continues at Diamond Craters.
- An off-road vehicle designation will be completed to regulate vehicular travel.
- Livestock trailing continues within the boundaries of Diamond Craters ONA.

# Part III

## The Management Plan



Dribblet spire

The management plan involves 16 separate actions to resolve the issue and accomplish the management objective. The identified issue discussed in Part I is listed along with the planned management actions which need to be implemented. Alternatives to the actions discussed in this section are presented in Appendix C.

### Issue—Environmental Protection and Rehabilitation

#### A. Acquisitions

##### Action A.1.—Land Base Adjustments Involving Private Lands

Acquire the following parcels of private land adjacent to the present boundaries of Diamond Craters ONA, if they become available. Adjustments can be through land exchanges or by purchase.

- (1) E $\frac{1}{2}$ , Sec. 16, T. 28 S., R. 32 E.
- (2) W $\frac{1}{2}$ NE $\frac{1}{4}$ , NW $\frac{1}{4}$ , N $\frac{1}{2}$ SW $\frac{1}{4}$ ,  
Sec. 36, T. 28 S., R. 32 E.
- (3) SE $\frac{1}{4}$ SE $\frac{1}{4}$ , Sec. 36, T. 28 S., R. 31 E.

### Discussion

If these private lands are offered for sale or exchange the Bureau should actively seek to acquire them in cooperation with the landowners. The parcels have large portions of the lava flow within their boundaries. A trail goes through Sec. 16 and a main county road goes through Sec. 36. Both provide access to fringes of the lava flow where adverse impacts are possible through removal of materials, dumping and possible leasing.

##### Action A.2.—Mineral Estate of Exchanged State Lands

Acquire mineral estate to W $\frac{1}{2}$ , Sec. 16, T. 28 S., R. 32 E., and SE $\frac{1}{4}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$ , Sec. 36, T. 28 S., R. 31 E.

### Discussion

The west half of Section 16 is now under Bureau administration since recent completion of a land exchange with the State of Oregon as is the SE $\frac{1}{4}$ NE $\frac{1}{4}$  and the NE $\frac{1}{4}$ SE $\frac{1}{4}$  of Section 36, T. 28 S., R. 31 E. However, since the mineral rights have been retained by the State, these areas are still subject to potential damage.

The boundaries of the Outstanding Natural Area can be readjusted and noted in the **Federal Register** when all proposed acquisitions are completed.

## **B. Cultural Values**

### **Action B.1.—Cultural Resource Protection**

Protect cultural sites and where feasible, interpret for public information and education.

#### **Discussion**

Executive Order 11593 for “Protection and Enhancement of the Cultural Environment” documented in 36 Federal Register 8921, May 13, 1971, directs Federal agencies to inventory their cultural resources and submit to the National Register of Historic Places all qualified sites meeting the criteria to protect all nominated sites. The entire Diamond Craters has not been surveyed for cultural resources although a preliminary archaeological survey of one site was completed in September, 1980. It is likely the Craters contains other archaeological sites as several sites have been reported on lands immediately adjacent to the area’s boundary.

Subsistence/activity patterns of prehistoric people in Diamond Craters are at this time unknown. It is apparent that water sources in and adjacent to Diamond Craters were used by prehistoric tribes. It is also logical to assume that the plant and animal resources which must have been present in prehistoric times were exploited by these people.

## **C. Supervision**

### **Action C.1.—Law Enforcement/Search and Rescue/Visitor Safety**

Continue the cooperative law enforcement and search and rescue agreement with the Harney County Sheriff’s Department to enforce regulations and provide visitor protection. The Department patrols the area to deter vandalism and guard against removal of slab lava and the destruction of other natural resources. The agreement outlines the responsibilities of both agencies and the amount and type of assistance each will provide in law enforcement situations. It should remain in force as long as it is economically feasible and acts as a viable management tool.

#### **Discussion**

The Bureau does not have the law enforcement or search and rescue capabilities in the form of trained and experienced personnel to provide visitor and resource protection in the district. However, since BLM personnel are familiar with the area and BLM equipment may be most available, full cooperation and sup-

port should be given to the law enforcement agencies.

### **Action C.2.—Recreational Use Monitoring**

Monitor the resource impacts of recreation use through:

1. Periodic patrols by vehicle and foot.
2. Locating traffic counters at strategic locations to record visitors entering and leaving the area and using specific sites.
3. Recordation of group numbers and purposes for using the ONA.
4. Issuance of recreation use permits for specific recreation, scientific study and education uses.
5. Periodic visitor use analysis as visitor numbers and/or recreation uses change from the present pattern.
6. Photo points for caves and other sensitive features to establish a visual base-line to determine physical changes and impacts.

#### **Discussion**

Monitoring is essential to correlate use levels with resource condition and capacity and will precede any decision for establishment of a recreation use allocation system.

### **Action C.3.—Visitor Use Allocation System**

Action Reserved. The current use level does not yet warrant this.

#### **Discussion**

A system to enforce visitor carrying capacities and allocate use among groups will not be implemented until monitoring indicates that visitor use is causing unacceptable resource damage, or measures are needed to minimize user conflicts. The principles for implementing a recreation use allocation system will be developed in a national BLM policy expected at a future date.

### **Action C.4.—Public Information and Education Program**

Develop an interpretative program for users which focuses on:

1. Visitor awareness of outstanding natural, scenic and cultural resources.
2. Environmentally acceptable visitor behavior which will protect cultural resources, wildlife habitat and populations, the natural character of the Craters and the enjoyment of the area by recreationists.
3. Off-road vehicle use.

## Discussion

Providing information about how visitors can best conduct themselves could alleviate potential resource conflicts, as well as the need for additional management actions. These materials would also compliment the monitoring program.

## D. Administration

### Action D.1.—Motorized Vehicle Use

Allow motorized vehicle use only on designated roads by initiating an Off-Road Vehicle (ORV) designation and posting of the area.

## Discussion

Much of Diamond Craters is not conducive to vehicle travel because of rough terrain. A few roads have been established in past years when the area was grazed by livestock and cinder pits were established. Some sections of these roads were constructed by bulldozers to provide passage for vehicles.

Some of these roads can continue to be used for management, but others should be closed. An Off-Road Vehicle designation limiting vehicle use to specific roads will enhance the ONA designation and provide protection for the fragile natural features.

### Action D.2.—Special Recreation Use Permits

Require special recreation use permits for individuals and groups in those cases involving specific recreation, scientific study and education activities which affect the recreational use of the other visitors or have an impact on the area's resource values. Fees may or may not be charged depending on the Bureau's determination of use. Determination will be made on a case-by-case basis with specific stipulations regulating use.

## Discussion

Special recreation permits are issued for specific recreational uses of the public lands and related waters. They are issued as a means to control visitor use, to protect recreational resources, and as a mechanism to accommodate commercial recreational uses. Authorized by the Land and Water Conservation Fund Act, there are four types of uses for which these permits are required — commercial, competitive, off-road vehicle use involving 50 or more vehicles, and individual or group use in special areas such as Diamond Craters.

Resource knowledge from inventories and research projects conducted by field classes from various colleges and universities needs to be accessible to the Bureau as part of a permit stipulation. Educators and specialized groups using the craters for projects will be required to have permits; thus the Bureau's use data, resource

knowledge, locations and magnitude of projects can be kept current.

A permit system may also be utilized in the future for all groups to alleviate problems arising when they visit the area during the same periods of time.

### Action D.3.—Land and Mineral Entry

Rehabilitate areas where cinders and slab lava have been removed and review all future leasing and material disposal operations causing surface disturbance under the most stringent interpretation of applicable regulations.

## Discussion

The surface disturbance associated with past cinder mining and removal of slab lava are the most damaging activities that have occurred in the area. Diamond Craters has now been withdrawn from the operation of the general land laws, including the mining laws, but not from leasing under the mineral leasing laws.

Cost and effect on the economics of any proposed operation should not be a limiting factor in designing mitigation measures. The principle consideration should be the protection and preservation of the land surface resources and air quality.

Some rehabilitative measures needed are sloping and fencing of disturbed areas, tearing down of mining monuments and replacement of lava slabs to areas where they were removed.

### Action D.4.—Wild Fire

Adopt a policy of letting natural fire burn within the Outstanding Natural Area.

## Discussion

All fires will be controlled to prevent loss of human life or property within the ONA or to prevent the spread of fires to areas outside the ONA where life or property may be threatened. The approved District Fire Management Plan will support methods of firefighting that do not allow the use of bulldozers or other heavy equipment for the building of firelines or roads within the boundaries of Diamond Craters. Since the majority of the area is lava flows, fires will be allowed to burn into the flows and go out.

Prescribed burning and presuppression measures and techniques may be allowed when necessary for the protection of public health or safety. Both will be allowed only in conformance with an approved Fire Management Plan which achieves the ONA objective with the minimum adverse impact on the resources. All fire control activities such as temporary fire camps, helispots,

and other sites should not be placed within the boundaries, if at all possible. Any such sites that are permitted shall be removed upon completion of use and the areas rehabilitated to as natural a state as possible.

## **E. Facility Management**

### **Action E.1.—Future Developments**

- Develop a central information center.

#### **Discussion**

An information/orientation center is needed where visitors can get information explaining resource values and recreational and educational opportunities. Material such as maps, guidebooks and safety brochures should be available for public use.

A campground could also be developed in the future if visitors begin to stay longer than a few hours, as is the present situation. At this time most visitors do not stay for a long enough period of time to justify the cost of a campground or make it a viable management tool.

- Provide interpretation using trailguides and brochures with small on-site location markers rather than installing interpretive signs.

#### **Discussion**

Using brochures and trailguides will require funding for periodic reprinting of material. Trailguides also require the user to put more effort in following directions and reading information. In addition, there is the possibility of vandalism and littering at information dispersal points. Moreover, the installation of signs at points of interest will be highly distracting in the Craters' environment and will require considerable upkeep and maintenance.

- Develop parking areas or pull-outs at or near points of observation where vehicular parking space is needed.

#### **Discussion**

Controlled vehicular parking is necessary to avoid random parking along roadsides to protect the environment and to promote visitor safety.

- Maintain natural conditions at points of interest where visitor use and recreational developments could destroy or significantly alter resource values.

#### **Discussion**

Preservation and protection of the environment should receive the highest priority when developments to enhance recreational uses are proposed. An example

of this is Malheur Maar which allows the public to seasonally observe muskrats, waterfowl, raptors, yellow-headed blackbirds and other wildlife when these species utilize the pond.

There may be a time when user impacts become significant enough that leaving "as is" will be detrimental and some development to mitigate the impacts will become an issue. Then, a management decision such as closure of a specific site or developments to mitigate impacts will have to be made.

### **Action E.2.—Signs Program**

Provide minimum signing for essential services only, including traffic management, facility and recreation use management, and the signing of the boundary around the edge of the withdrawal.

#### **Discussion**

Signing, following a sign plan, is necessary for safety, providing direction and information and is essential for implementing an interpretive program. However, emphasis will be toward limiting sign numbers. See Action II.A.4 for the features an interpretive program should address.

## **F. Area Access**

### **Action F.1.—Existing Roads**

- Maintain the road to Oliver Springs to allow safe travel of passenger cars.
- Do not maintain the road to Little Red Cone but keep it at a low standard of construction to allow passage of high clearance vehicles.
- Close roads or trails that are not necessary for management of the area.

#### **Discussion**

Low standard roads are compatible with providing recreation opportunities in a setting ranging from an essentially unmodified environment to one that is generally natural with moderate evidence of the sights and sounds of man.

At times certain roads may be graded to allow passage of standard motor vehicle, but others should be allowed to revert back to a natural state or maintained as foot trails and no longer be available for vehicle use. Most of these roads are on steep hillsides where erosion caused by vehicles driven to the ridgetops is a problem. See Map 3 for roads that are designated to be open or closed to vehicle use.

## **Action F.2.—New Road Development**

Develop no additional roads to allow motorized vehicle use in Diamond Craters.

### **Discussion**

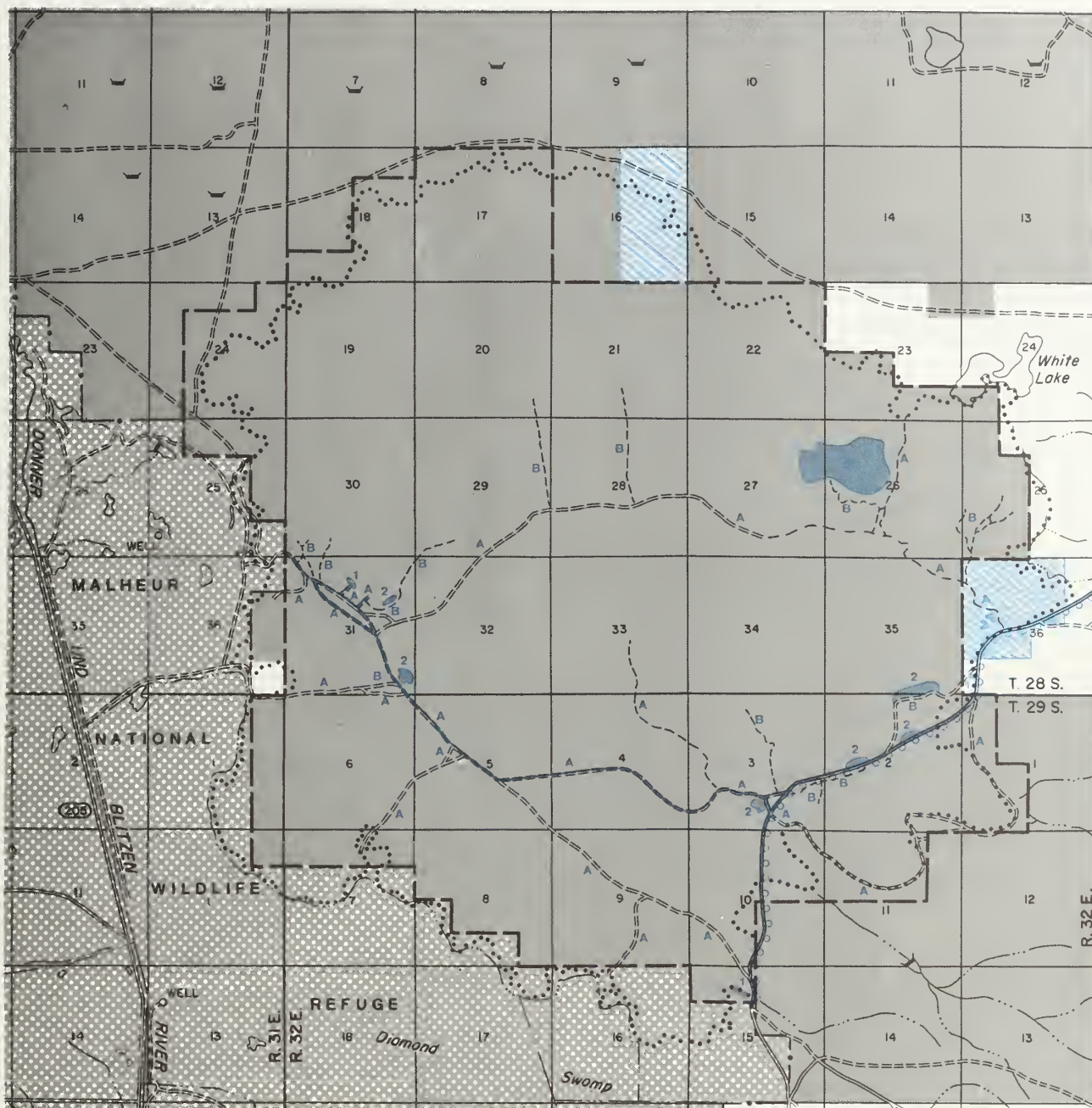
It would be impossible to maintain the natural resource values in this fragile environment if the area is subjected to continued manipulation justified by the need to provide improved motorized vehicle access. The present road system is suitable to provide visitors needed access to view features and use the resources for scientific and educational purposes. Vehicle travel on the road passing Keyhole Crater to Big Cinder Crater is causing damage to the hillside. Realignment of the road is not a feasible alternative as the same damage to natural features that now exists would still continue because of the steepness of the terrain. Consideration will be given to closing the road and converting it to a hiking trail if public sentiment favors this proposal.

## **Action F.3.—High Desert Trail Route/Other Trails**

Allow the proposed High Desert Trail to go through Diamond Craters. Also develop other trails to accommodate and enhance the recreation experience offered by the area, while using the trails as a tool to provide protection of fragile resources.

### **Discussion**

The Desert Trail is a recognized component of the Oregon Recreation Trails System and eventually will become recognized nationally. This will draw attention to this area and people from various walks of life will utilize the recreational values of Diamond Craters. This and other trails can help to guide people around or through areas of concern where natural values can be interpreted, but protection is necessary. If trails are not developed, it can be expected that random wandering will eventually create some irreparable damage.



#### ROADS & TRAILS

- A Roads to be kept open to vehicle travel
- B Roads to be closed to all vehicle travel
- ○ ○ Proposed Desert Trail Route
- Self-Guided Auto Tour

#### DISTURBED AREAS

- 1 Abandoned Dump Sites
- 2 Cinder Borrow Pits
- 3 Slab Rock Trespass Area

LAND BASE ADJUSTMENTS - PRIVATE LANDS

### MAP 3

## DIAMOND CRATERS

U.S. DEPARTMENT OF THE INTERIOR  
Bureau of Land Management

Burns District

1985

1 0 1 2 MILES

# PART IV IMPLEMENTATION, PHASING AND COST ESTIMATES



Malheur Maar

The following Table 3 shows planned actions and cost estimates for the recreation lands management program through fiscal year 1995. The actions discussed in Part III, The Management Plan, are scheduled for implementation during the 10-year period. While additional planning, survey and design and/or construction may be necessary to fully implement some of the actions, others can be fulfilled with a minimum of preliminary work. Cost estimates are not shown for some actions as additional funding is not necessary for their implementation and continued management. Acquisition of private land will most likely be completed through exchange rather than purchase as current funding levels preclude the opportunity for purchasing land by the Bureau at this time.

The following summary of the total estimated funding needs is shown by fiscal year.

Fiscal Year	Total Estimated (\$) Funding Needs
1986	10,000
1987	35,000
1988	45,700
1989	16,700
1990	16,700
1991	13,700
1992	15,700
1993	11,700
1994	8,700
1995	9,700
<b>Total</b>	<b>183,600</b>

**Table 3 Planned Actions and Implementation Cost Estimates**

Action	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	Total Estimated Costs
A.1. Land Base Adjustments/ Private Lands		15,000	15,000								30,000
A.2. Mineral Estate of Exchanged State Lands					3,000						3,000
B.1. Cultural Resource Protection		5,000									5,000
C.1. Law Enforcement/ Search & Rescue/ Visitor Safety	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	15,000
C.2. Recreational Use Monitoring	4,500	4,500	5,500	4,500	4,500	4,500	5,500	4,500	4,500	4,500	47,000
C.3. Visitor Use Allocation System (Reserved)					NO PROGRAMMED COST						
C.4. Public Information & Education Program	2,000	2,000	3,000	2,000	2,000	2,000	2,000	5,000	2,000	2,000	24,000
D.1. Motorized Vehicle Use	500	1,000	200	200	200	200	200	200	200	200	3,100
D.2. Special Recreation Use Permits					NO PROGRAMMED COST						
D.3. Land and Mineral Entry					NO PROGRAMMED COST						
D.4. Wild Fires					NO PROGRAMMED COST						
E.1. Future Developments Survey & Design Construction		4,500	15,000	5,000							4,500 20,000
E.2. Signs Program	1,000	1,000	5,000	3,000			1,000			1,000	12,000
F.1. Access—Existing	500	500	500	500	500	500	500	500	500	500	5,000
F.2. New Road Access					NO PROGRAMMED COST						
F.3. High Desert Trail/ Other Trails					5,000	5,000	5,000				15,000
<b>FY TOTALS</b>	<b>10,000</b>	<b>35,000</b>	<b>45,700</b>	<b>16,700</b>	<b>16,700</b>	<b>13,700</b>	<b>15,700</b>	<b>11,700</b>	<b>8,700</b>	<b>9,700</b>	<b>183,600</b>

# PART V - APPENDICES



Roofed tube on surface of lava flow

## Appendix A—Planning Participants and Cooperators

### Management Participation

Joshua L. Warburton, District Manager  
Malcolm T. Shrode, Three Rivers Resource  
Area Manager  
Victor E. Pritchard, Assistant District  
Manager for Resources

### Staff Participation

David E. Vickstrom, Outdoor  
Recreation Planner  
Fred Taylor, Wildlife Specialist  
Geoffrey L. Haskett, Realty Specialist  
George B. Brown, Geologist  
Mark L. Armstrong, Supervisory Range  
Conservationist  
Teresa M. Gibson, Public Affairs  
Specialist

### Other Agency and Interested Group Participation

BLM Burns Advisory Board  
Harney County Planning Commission  
Desert Trail Association  
Pacific N.W. Natural Area Committee  
Natural Heritage Advisory Council  
Native Plant Society of Oregon  
Public Lands Institute  
Oregon Council of Rocks and Minerals Clubs  
American Cave Conservation Association, Inc.  
Oregon Natural Heritage Database

# Appendix B

## Applicable Federal and State Laws and Regulations

- Federal Land Policy and Management Act: Public Law 94-579: 94th Congress, October 21, 1976;
- 43 Code of Federal Regulations: Subchapter B—Land Resource Management (2000); Subchapter H—Recreation Programs (8000);
- Land and Water Conservation Fund Act of 1964, 16 U.S.C. 460 1-1 et. seq.;
- Recreation and Public Purposes Act of 1926, 43 U.S.C. 869 et. seq.;
- National Environmental Policy Act of 1969, 42 U.S.C. 4321;
- Antiquities Act of 1906 (34 Stat. 225, 16 U.S.C. 432, 433);
- Executive Order 11593, Protection and Enhancement of the Cultural Environment;
- Executive Order 11644, Use of Off-Road Vehicles on Public Lands;
- Secretarial Order No. 2924, Responsibility for Planning the National Wild and Scenic Rivers System and the National Trails System;
- National Trail System Act of 1968, 16 U.S.C. 1241 et. seq.;
- Public Land Administration Act, July 14, 1960 (74 Stat. 506);
- Oregon Administrative Rules, Chapter 736, Division 40—State Parks and Recreation Division.

# Appendix C

## Management Program Alternatives

The management program presented in Part III resulted from an assessment of various alternatives to resolve identified issues. Alternatives considered but not included as part of the management program are listed below. For some actions, there are no alternatives which could be implemented to resolve issues within the framework of the stated management objective.

### Issue—Environmental Protection and Rehabilitation

#### ***Action A.1.—Land Base Adjustments Involving Private Lands***

**Alternative**—No Action. Private lands would remain along the ONA boundary and portions of the lava flow would not be protected. Some natural and cultural values may be altered or destroyed.

#### ***Action A.2.—Mineral Estate of Exchanged State Lands***

**Alternative**—No Action. Acquired State lands would not be protected from mineral entry and some natural and cultural values could be altered or destroyed.

#### ***Action B.1.—Cultural Resource Protection***

**Alternative**—No viable alternative determined.

#### ***Action C.1.—Law Enforcement/Search and Rescue/Visitor Safety***

**Alternative**—Develop no cooperative agreements for law enforcement or search and rescue but rely on State laws and a working relationship between the Oregon State Police, the Harney County Sheriff's Department and the BLM to handle situations. This would work as long as lines of communications are kept open and county funds are available to make patrols.

#### ***Action C.2.—Recreational Use Monitoring***

**Alternative**—Do not monitor recreation use. Unacceptable impacts on resources from public use could continue for an undetermined length of time.

#### ***Action C.3.—Visitor Use Allocation System***

**Alternative**—Reserved.

#### ***Action C.4.—Public Information and Education Program***

**Alternative**—No viable alternatives determined.

#### ***Action D.1.—Motorized Vehicle Use***

**Alternative**—Close Diamond Craters to any form of motorized vehicle use including all roads. This would protect the resources, but would limit the use of the area by the public, scientists and educators. Leaving certain roads open and converting others to foot trails should provide access and still give a high measure of protection.

#### ***Action D.2.—Special Recreation Use Permits***

**Alternative**—Allow unregulated visitor use of the Craters. This could result in damage to natural and cultural resources through excessive and uncontrolled use as well as increased conflicts between groups and loss of data and resource knowledge of the area.

#### ***Action D.3.—Land and Mineral Entry***

**Alternative**—No viable alternative determined.

#### ***Action D.4.—Wild Fires***

**Alternative**—Continue fighting fire in Diamond Craters using traditional methods including the utilization of heavy equipment to build firelines and roads. Impacts to resources would be considered, but fewer restrictions would be imposed to contain and control fires.

#### ***Action E.1.—Future Developments***

**Alternative 1**—Develop an interpretive program using interpretive signing rather than brochures & trailguides. Provide parking areas and information/orientation center as previously recommended.

**Alternative 2**—Develop no interpretive sites but let visitors identify and educate themselves to the natural features by using the present auto tour guide and their own expertise and knowledge of the area. Visitors can continue obtaining the guide pamphlet from the Burns District Office.

## **Action E.2.—Signs Program**

**Alternative**—No viable alternative determined.

## **Action F.1.—Existing Roads**

**Alternative**—Do not close any roads or trails to motorized vehicles. Periodically maintain roads so vehicles can drive to points of interest such as Keyhole, Crater, Little Red Cone, and Shotgun Springs.

## **Action F.2.—New Road Development**

**Alternative**—Develop vehicle access to features of interest if the terrain makes it feasible for road construction. A low number of roads would be developed because so much of the area is not conducive to vehicle travel.

## **Action F.3.—High Desert Trail/Other Trails**

**Alternative**—Do not develop any trails or delineate routes to enhance the visitor's experience, but let people hike over the lava flows as best they can without any specific direction.

Conflicts can arise with visitors using areas with special wildlife or plant needs. Routing backpackers through Diamond Craters is necessary to get hikers through the area and routed on to another point of destination. The Desert Trail encompasses the natural border-to-border concept and Diamond Craters is only a small portion of the overall trail route.

# Appendix D—Writings of Interest

## **Mehringer, Peter J., Jr.**

1985. Late-Quaternary pollen records from the interior Pacific Northwest and Northern Great Basin of the United States. In *Pollen Records of Late-Quaternary North American Sediments*, V.A. Bryant and R.G. Holloway (eds.). American Association of Stratigraphic Palynologists, Dallas, Texas, pp. 165-187.

## **Mehringer, Peter J., Jr. and Peter E. Wigand**

1985. Prehistoric distribution of western juniper. In *Proceedings of the Western Juniper Management Short Course*, October 15-16, 1984, Bend, Oregon. Oregon State University Extension Service, Corvallis, Oregon, pp. 1-9.

## **USDI—BLM**

1980. ACEC Plan Element, Burns District, Oregon.

## **USDI—BLM**

1978. Drewsey Management Framework Plan (MFP), Burns District, Oregon.

## **USDI—BLM**

1980. Diamond Craters Outstanding Natural Area and Protective Withdrawal (OR 10676) Environmental Assessment, Burns District, Oregon. A list of 118 references can be found in this assessment. Also, the Appendix contains the following material:

Letter From Natural Area Preserves Advisory Committee  
Letter From the Pacific Northwest Natural Area Committee  
Harter Speleological Report  
Tentative List of Vascular Plants Identified From Diamond Craters  
Tentative List of Amphibians and Reptiles Utilizing Diamond Craters  
Tentative List of Mammals Utilizing Diamond Craters  
Tentative List of Birds Utilizing Diamond Craters  
Archeological Report

## **Wigand, Peter E.**

1985. Diamond Pond, Harney County, Oregon: *Man and marsh in the eastern Oregon Desert*. Ph.D. Thesis. Washington State University, Pullman, Washington, 265 p.

Form 1279-3  
(June 1984)

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